



Type SKD and SKE
Check Synchronising Relays

ALSTOM

Type SKD and SKE Check synchronising relays

SKD relay
withdrawn from case



Features

- Low burden, static design.
- Accurate and reliable.
- Immune to transient and surges; withstands 5 kV impulse voltage test.

Application

Check synchronising relays are used to prevent interconnection of badly synchronised supplies. Type SKD relays are generally used in auto reclosing sequence of interconnectors along with the auto reclosing relay. Type SKE relays are used to safeguard manual synchronising of generators. The check synchronising relay contacts are normally connected in series with the circuit breaker closing circuit and ensures that the differences in phase, voltage and frequency are within pre-selected limits before switching in an incoming alternator or interconnecting two sections of a power system.

General description

Phase difference measurement

Phase measurement is achieved by algebraically subtracting the two supply voltage waveforms and comparing the resultant modulated beat waveform envelope with a dc reference voltage (See Figure 1). The dc reference is proportioned to the sum of the peaks of the two supply voltages to provide phase measurement independent of supply voltage variation.

Referring to Figure 2, the resulting voltage produced after subtraction is passed via the gate (which is opened when the VT1 supply is present) to the phase angle comparator and integrating amplifier.

The signal is compared with the dc reference and produces a smoothed output to the relay drive unit if the signal is less than dc reference. The relay drive circuit prevents chatter of the relay at the just-operate condition.

Frequency difference measurement

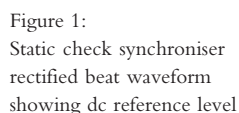
Frequency difference measurement is achieved by checking that the phase angle traversed in a defined period is less than a pre-determined value.

Referring to the block diagram the output from the phase measurement circuit drives an accurately calibrated timer. The timer operates the relay on completion of its timing cycle, if the output from the phase measurement circuit persists.

The relationship between timer setting and frequency difference is given in Table 1.

Voltage difference measurement

Two types of voltage lockout are available. Type SKD compares the amplitude of the two supply voltages, with a stabilised dc reference which is proportioned to the nominal supply voltage. The



- | | |
|--|--|
| 1. Rectified emf-e (by subtraction of running and exciting voltages) | 4. In-phase condition |
| 2. D.C. reference level | 5. $\pm 30^\circ$ out of phase |
| 3. Angle over which synchronising can occur | 6. Time to cover one slip cycle (3.6°) |

voltage lockout circuit inhibits the gate if either voltage is below the preset limit. Type SKE compares the two supply voltages and inhibits the gate if the difference between the supply voltages exceeds the preset limit.

Technical data

Voltage rating

110 volts/63.5 volts ac, 50 Hz.

Auxiliary supply

50V, 110V and 220V dc.
For 110V dc and above, external
dropping resistors are used.

Minimum operating voltages

Type SKD

Either supply below setting.

Type SKE

Both supplies at 37%.

Settings

Phase angle, frequency difference and voltage difference settings as shown in Table 1.

Operating time

200 m.sec. with timer disconnected.

Burden

2.5VA at rated voltage on each supply.

Accuracy

±5% on voltage lockout setting.

Thermal rating

AC supply voltage

115% of rating.

DC supply

120% of rating.

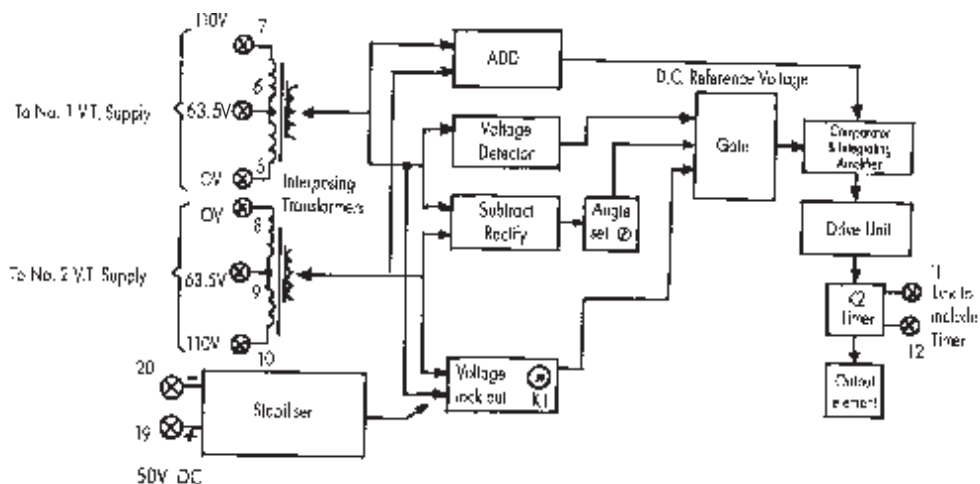


Figure 2:
Composite block diagram

Table 1:
Check synchroniser types and settings

Relay	Phase angle difference setting	Frequency difference setting		Frequency percentage difference 50 Hz	Voltage setting
		Phase angle	Time setting (secs)		
SKD auto reclose check synchroniser	Preset at 35° +0% – 5%	35°	2	0.19	Lockout continuously variable. 80-90% nominal voltage.
		35°	3	0.13	
		35°	4	0.09	
		35°	5	0.08	
		35°	6	0.06	
		35°	10	0.04	
SKE gen. check synchroniser	Preset at 20° +0% – 5%	20°	0.5	0.45	Difference continuously variable. Voltage difference calibrated.
		20°	1.0	0.22	
		20°	1.5	0.15	
		20°	2.0	0.11	
		20°	2.5	0.09	
		20°	3.0	0.07	
	Preset at 10° +0% – 5%	10°	0.25	0.45	at 2%, 4%, 6%, 8% & 10% nominal voltage
		10°	0.5	0.22	
		10°	0.75	0.15	
		10°	1.0	0.11	
		10°	1.25	0.09	
		10°	1.5	0.07	

Contacts

Two normally open contacts, or one make and one break.

Contact rating

Make and carry 7500VA for 3 seconds with maximum of 30A and 660 volts.

Insulation

The relay meets requirements of IS 3231-1965/IEC 255-5 Series C-2 kV for 1 minute.

Impulse voltage

The relay complies with the requirements of IS 8686-1977/IEC 255-4 Appendix E to class III.

High frequency interference

The relay complies with IS 8686-1977/IEC 255-22-1 Appendix C to class III.

Case

1D drawout cases suitable for flush/projection mounting.

Information required with order

1. Relay type
2. Voltage rating
3. Auxiliary supply voltage
4. Type of mounting



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